What is claimed is:

1. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near a heat source, such that the fluid is directed toward said heat source.

2. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent.

3. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation.

4. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source.

5. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

said flow paths are formed of a plurality of flow paths extending in multiple directions.

6. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near a heat source, such that the fluid is directed toward said heat

source.

7. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

8. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

9. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near a heat source, such that the fluid is directed toward said heat source.

10. A counter-stream-mode oscillating-flow heat transport apparatus for inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent, and

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation.

11. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent, and

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source.

12. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent, and

said flow paths are formed of a plurality of flow paths extending in multiple directions.

13. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation, and

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source.

14. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation, and

said flow paths are formed of a plurality of flow paths extending in multiple directions.

15. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source, and

said flow paths are formed of a plurality of flow paths extending in multiple directions.

16. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least

said adjacent flow paths of said flow paths is bent,

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

17. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

18. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and

transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near a heat source, such that the fluid is directed toward said heat source.

19. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

20. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing

oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

21. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

22. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation, and

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source.

23. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation, and

said flow paths are formed of a plurality of flow paths extending in multiple directions.

24. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing

oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source.

25. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source.

26. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to

thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

27. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a plurality of the flow paths disposed adjacent to a heat source in a direction of fluid oscillation extend in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat

source.

28. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a heat reservoir for accumulating heat is disposed between a heat source and said flow path having a fluid therein for absorbing heat from said heat source,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

29. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

a heat reservoir for accumulating heat is disposed

between said heat source and said flow path having a fluid therein for absorbing heat from said heat source,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

30. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source, and

said flow paths are formed of a plurality of flow paths extending in multiple directions.

31. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing oscillations of counterflow fluids in adjacent flow paths to

thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a bounding portion for defining a boundary of at least said adjacent flow paths of said flow paths is bent,

a plurality of said flow paths are disposed adjacent to a heat source in a direction of fluid oscillation,

a heat reservoir for accumulating heat is disposed between said heat source and said flow path having a fluid therein for absorbing heat from said heat source,

said flow paths are formed of a plurality of flow paths extending in multiple directions, and

oscillatory displacement is imparted to a fluid of the fluids in said flow paths, the fluid being located near said heat source, such that the fluid is directed toward said heat source.

32. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 2, wherein

the bounding portion for defining the boundary of at least said adjacent flow paths of said flow paths is bent in two dimensions.

33. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 2, wherein

the bounding portion for defining the boundary of at least said adjacent flow paths of said flow paths is bent in three dimensions.

34. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 4, wherein

said heat reservoir is formed of a material having a specific heat greater than or equal to that of a member constituting said flow paths.

35. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 4, wherein

said heat reservoir is constructed such that a portion of members constituting said flow paths, the portion facing said heat source, is thicker in thickness than a bounding portion for defining a boundary of said adjacent flow paths.

36. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 1, wherein

said flow paths are stacked in multiple layers in a direction from said heat source toward said flow paths.

37. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 1, wherein

a portion, of members constituting said flow paths, other than a bounding portion for defining a boundary of said adjacent flow paths is formed of a soft material.

38. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 1, wherein

said flow paths are constructed such that material plates are shaped by etching or stamping and stacked in layers in a direction of their thickness.

39. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 1, wherein

said flow paths are constructed by jointing a wavy material plate having holes formed thereon and plate-shaped material plates together.

40. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 1, wherein

a movable element to be displaced by an electromagnetic force and a piston for creating fluid oscillations are integrated into an oscillating device for inducing fluid oscillations.

41. A cooling device for cooling a heat-generating element using the counter-stream-mode oscillating-flow heat transport apparatus according to claim 1, further comprising:

a radiating fin for enhancing heat exchange between the fluid in said flow paths and an external fluid, wherein

an inside region the radiating fin is in communication with said flow paths.

42. A counter-stream-mode oscillating-flow heat transport apparatus defining flow paths and inducing

oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, wherein

a plurality of said flow paths are stacked in layers in a crossover direction relative to a plane in contact with a heat source.

43. A heat transport apparatus, comprising:

a plurality of flow paths for a fluid to flow therethrough, for transporting heat generated by a heat source from a hot region to a cold region via said fluid, wherein

a microchannel is formed in said flow paths in a vicinity of said heat source, said flow paths being smaller in size relative to other portions.

44. The heat transport apparatus according to claim 43, further comprising:

a tube-shaped aluminum member defining a plurality of through-holes formed parallel to each other, said through-holes constituting at least part of said flow paths.

45. The heat transport apparatus according to claim 43, wherein

said microchannel is formed by applying an external force and thereby compressing said flow paths in the vicinity of said heat source.

46. The heat transport apparatus according to claim 44, wherein

said microchannel is formed by applying an external force and thereby compressing said flow paths in the vicinity of said heat source.

47. The heat transport apparatus according to claim 43, wherein

said microchannel is formed of any one of at least one tubular member and at least one rod-like member disposed in said flow paths in the vicinity of said heat source.

48. The heat transport apparatus according to claim 44, wherein

said microchannel is formed of any one of at least one tubular member and at least one rod-like member disposed in said flow paths in the vicinity of said heat source.

49. The heat transport apparatus according to claim 43, wherein

said microchannel is formed of a metal defining a cavity which is in communication from one end to the other end in a flow direction of said fluid, the metal being disposed in said flow paths in the vicinity of said heat source.

50. The heat transport apparatus according to claim 44, wherein

said microchannel is formed of a metal defining a cavity which is in communication from one end to the other end in a flow direction of said fluid, the metal being disposed in said flow paths in the vicinity of said heat source.

51. The heat transport apparatus according to claim 47, wherein

said metal with the cavity is formed of a metal selected from the group consisting of a foamed metal, a sintered metal, and a metal formed by thermal spraying.

52. The heat transport apparatus according to claim 43, wherein

a flow of said fluid is an oscillating flow with a predetermined cycle and a predetermined amplitude.

53. The heat transport apparatus according to claim 44, wherein

a flow of said fluid is an oscillating flow with a predetermined cycle and a predetermined amplitude.

54. A counter-stream-mode oscillating-flow heat transport apparatus for inducing oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat from a hot region to a cold region, said apparatus comprising:

a multi-hole tube defining a plurality of holes formed to

penetrate longitudinally from a first tube end to a second tube end,

first plates coupled to longitudinal ends of said multi-hole tube, said first plates defining through-holes to allow adjacent holes to communicate with each other, and

second plates coupled to said first plates to block said through-holes, wherein

said multi-hole tube and said first and second plates constitute said flow paths.

55. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 54, wherein

said multi-hole tube is fabricated by an extrusion process or a drawing process.

56. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 54, wherein

said first plates are formed into a predetermined shape by pressing.

57. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 55, wherein

said first plates are formed into a predetermined shape by pressing.

58. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 55, wherein

said multi-hole tube and said first and second plates are joined together by brazing.

59. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 56, wherein

said multi-hole tube and said first and second plates are joined together by brazing.

60. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 59, wherein

said first plates are made of a clad material having a surface coated with a filler metal.

61. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 54, wherein

said multi-hole tube and said first and second plates are made of an aluminum alloy.

62. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 60, wherein

said multi-hole tube and said first and second plates are made of an aluminum alloy.

63. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 54, wherein

a second multi-hole tube having a different pitch between said adjacent holes is coupled to said multi-hole tube.

64. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 61, wherein

a second multi-hole tube having a different pitch between said adjacent holes is coupled to said multi-hole tube.

65. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 63, wherein

said second multi-hole tube is coupled to said multi-hole tube via a clad material having both front and rear surfaces coated with a filler metal.

66. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 63, wherein

a heat-generating element is disposed on a surface of said second multi-hole tube.

67. The counter-stream-mode oscillating-flow heat transport apparatus according to claim 65, wherein

a heat-generating element is disposed on a surface of said second multi-hole tube.

68. A counter-stream-mode oscillating flow heat transport apparatus for including oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat of a heat generating element from a hot region to a cold region, the apparatus comprising:

a plurality of heat transport device assemblies (2) that form the flow paths therein,

wherein the plurality of heat transport device assemblies are stacked in layers,

wherein directions of the oscillating flows in the adjacent heat transport device assemblies are opposite,

wherein the heat transport device assembly that is in contact with the heat generating element is smaller than the other heat transport device assemblies.

69. A counter-stream-mode oscillating flow heat transport apparatus for including oscillations of counterflow fluids in adjacent flow paths to thereby exchange heat between said adjacent flow paths and transport heat of a heat generating element from a high temperature side to a low temperature side, the apparatus comprising:

two heat transport device assemblies that form the flow paths therein,

wherein the heat transport device assemblies are stacked in layers,

wherein directions of the oscillating flows in the adjacent heat transport device assemblies are opposite,

wherein the heat transport device assembly that is in contact with the heat generating element is smaller than the remaining heat transport device assembly.